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(54) Title: FAST HIERARCHICAL TOMOGRAPHY METHODS AND APPARATUS

(57) Abstract: Pixel images f are created from projections ($q_1 \ldots q_p$) by backprojecting (100) selected projections to produce intermediate images (I_1, m), and performing digital image coordinate transformations (102) and/or resampling (Fig. 31, 186, 192, 196) on selected intermediate images. The digital image coordinate transformations (102) are chosen to account for view angles of the constituent projections of the intermediate images and for their Fourier characteristics, so that the intermediate images may be accurately represented by sparse samples. The resulting intermediate images are aggregated into subsets (104), and this process is repeated in a recursive manner until sufficient projections and intermediate images have been processed and aggregated to form the pixel image f. Digital image coordinate transformation can include rotation (Fig. 18, 102), shearing (Fig. IOB, 120, 122), stretching, contractions (109), etc. Resampling can include up-sampling (101, 106), down-sampling (109), and the like. Projections (Fig. 32, $p\theta_1 \ldots p\theta_{18}$) can be created from a pixel image (f), by performing digital iamge coordinate transformation (202) and/or resampling (204) and/or decimation (Fig. 32, 204; Fig. 33, 212) re-projecting the final intermediate image (208).